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10/005,993	11/08/2001	Hany Aziz	D/A1407	3023

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EXAMINER
GARRETT, DAWN L

ART UNIT	PAPER NUMBER
1774	3

DATE MAILED: 06/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/005,993	AZIZ ET AL.	
	Examiner	Art Unit	
	Dawn Garrett	1774	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 November 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-42* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 November 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Objections

1. Claim 32 is objected to because of the following informalities:

A parentheses should be added after "(PtOEP" in part (iii) of claim 32.

Appropriate correction is required.

2. Claims 27-32 and 34 are objected to because of the following informalities: Claims 27-32 and 34 use numbering such as (i)-(iii)... which does not correspond to the same numbered components (i)-(vi) in claim 1, upon which claims 27-32 and 34 depend. For example, in claim 1, the region comprising a mixture is (ii) while in dependent claim 29 the mixed region is (iii). It is suggested for purposes of clarity that other consecutive numbering such as (a)-(e), etc. be used for the dependent claims or that the same numbering for each layer of claim 1 also be applied in the dependent claims.

3. Claims 28 and 32 are objected to because of the following informality:

It is suggested that "and" at the end of part (ii) of claims 28 and 32 be changed to "or". The examiner has interpreted the claim to require one of (i), (ii) or (iii).

4. Claim 37 is objected to because of the following informalities: Claim 37 refers to "said protective layer", but claim 1 uses the term "thermal layer". The examiner has interpreted the protective layer of claim 37 as the thermal layer recited in claim 1. It is suggested claim 37 be amended to terminology consistent with claim 1. Appropriate correction is required.

5. Claims 27, 29 and 31 are objected to because of the following informalities: Part (v) of claim 29 recites a cathode comprised of "one of (1) a first layer...and (2) a second layer". It is suggested that since "comprised of one of" language is used, "or" should be used instead of "and" between (1) and (2). The examiner has interpreted the claim to require one of either (1) or (2) as the cathode layer. Appropriate correction and/or clarification is requested.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-9, 12-14, 22-24, 26, 32, 38, and 40-42 are rejected under 35 U.S.C. 102(b) as being anticipated by Nakaya et al. (US 5,792,557). Nakaya et al. discloses organic EL elements comprising tetraaryldiamine derivatives including biphenyl TPD (see abstract and col. 91-92, compound X-1). Figure 1 depicts an exemplary structure of the device comprising a substrate 2, an anode 3, a hole injecting and transporting layer 4, a light emitting layer 5, an electron injecting and transporting layer 6, and a cathode 7 stacked in order top to bottom (see col. 115, lines 55-64). It is particularly preferred to provide a mixed layer that acts as the light emitting layer comprising the inventive compound (i.e. biphenyl TPD, compound X-1) and a compound having an electron injecting and transporting function (see col. 121, lines 54-58) per instant claims 1 and 42 mixed region (ii). It is noted that the thermal layer (iv) is

recited as optional in claims 1 and 42. Per instant claim 2, hole transporting material includes aromatic tertiary amines (col. 117, lines 5-9) and electron transporting material includes metal oxinoids such as tris(8-quinolinolato)aluminum and quinoline derivatives (see col. 120, lines 49-54). Per instant claims 3 and 6, the preferred electron transporting and injecting material to be mixed with the inventive compound (i.e. biphenyl TPD) is tris(8-quinolinato)aluminum, a metal oxinoid (see col. 121, lines 58-63). It is preferred the Nakaya et al. mixed light emitting layer comprise from 30 to 70 % by weight of the mix layer of the inventive compound (i.e. biphenyl TPD, compd. X-1) per instant claims 4 and 5 (see col. 122, lines 12-20). Nakaya et al. discloses preferred embodiments include doping of the organic compound layers with luminescent material such as rubrene in an amount of 0.1-20 % by weight (see col. 121, lines 10-12 and col. 121, lines 37-41) per instant claims 7-9 and 32. Instant claim 12 requires at least one of "(A) said hole transport region (v) comprising N,N'-bis(p-biphenyl)-N,N'-diphenyl benzidine (biphenyl TPD); and (B) said electron transport (vi) contains an electron transport material, and wherein the electron transport material, and wherein the electron transport material in the mixed region (ii) and (vi) are similar components". Nakaya et al. is deemed to anticipate both parts (A) and (B) of instant claim 12. Per instant claim 12 part B, a preferred embodiment discloses a hole transporting layer comprising the inventive compound (i.e. biphenyl TPD, compound X-1) and a light emitting mixed layer comprising the inventive compound and a compound having an electron injecting and transporting function (see col. 122, lines 4-11). Per instant claim 12 part (B), tris(8-quinolinolato) aluminum is discloses as preferred electron transporting material portion

of the mixed light emitting layer (see col. 121, lines 62-63) and the electron transporting layer (see col. 120, lines 49-51). Per instant claim 13, part (A), preferred hole transporting layer materials include aromatic tertiary amines other than the inventive compounds (i.e. biphenyl TPD) (see col. 117, lines 5-6). Figure 1 discloses a device comprising one hole transporting layer, one light-emitting layer, and one electron transporting layer per instant claims 14 and 38 (see col. 115, lines 58-64). Per instant claims 22-24, a Nakaya et al. preferred anode is comprised of indium tin oxide (ITO) (see col. 123, lines 64-66) and a preferred cathode is comprised of Li (an alkaline metal), Na (an alkaline metal), or Al and alloys containing at least one of those (see col. 123, lines 55-56). Per instant claim 26, Nakaya et al. discloses each of the light emitting layer, hole injecting and transporting layer, and electron injecting and transporting layer are each, as a single layer, from about 5 to 1,000 nm thick and preferably from about 10 to 200 nm thick (see col. 116, lines 28-32). Nakaya et al. describes the preferred electron transporting material tris(8-quinolinato)aluminum, which is included in the mixed layer, as luminescent material at (col. 120, lines 38-44) per instant claims 40 and 43. In addition, the mixed layer may be doped with a compound providing a light emitting function (col. 121, lines 49-52) per instant claim 41. Nakaya et al. is deemed to disclose all elements of claims 1-9, 12-14, 22-24, 26, 32, 38, and 40-42.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 15-17 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakaya et al. (US 5,792,557). Nakaya et al. is relied upon as set forth above. Nakaya et al. figure 1 discloses a device comprising one hole transporting layer, one light-emitting layer, and one electron transporting layer per instant claims 14 and 38 (see col. 115, lines 58-64). Nakaya et al. fails to disclose specifically that the electron transport layer may be subdivided into two electron transport layers per instant claim 15. Claim 15 requires an electron transport layer contacting the mixed region and an electron transporting layer contacting the cathode. Both of these claimed two layers may be comprised of metal oxinoid. As stated previously, Nakaya et al. teaches the metal oxinoid tris(8-quinolinolato) aluminum as preferred electron transporting material (see col. 120, lines 49-51) per instant claim 16. It would have been obvious to one of ordinary skill in the art at the time of the invention to have formed two layers of tris (8-quinolinolato) aluminum electron transporting material, because two layers would

perform the same function of electron transporting as a single layer of electron transporting material. Similarly, instant claim 39 requires each region of the device have 2-4 layers and claim 17 requires two layers of the hole transporting region, it would have been obvious to one of ordinary skill in the art at the time of the invention to have formed two layers of the same material for each of the hole transporting region, mixed region, and electron transporting region, because two or more layers of the same material would perform the same function as a single layer.

11. Claims 18-21, 36, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakaya et al. (US 5,792,557) in view of Hosokawa et al. (US 5,458,977). Nakaya et al. is relied upon as set forth above. Nakaya et al. teaches the hole transporting region may comprise any hole transporting material conventionally known for use in organic EL elements (see col. 117, lines 1-5). Nakaya et al. specifically mentions aromatic tertiary amines as hole transporting material and also teaches the inventive compound biphenyl TPD (compound X-1) as hole transporting material (see col. 117, lines 5-9 and col. 120, lines 35-37). Nakaya et al. does fail to teach copper phthalocyanine as a hole transporting material used in the inventive devices as required by instant claims 18-21, 29, 30, 36, and 37. Hosokawa et al. teaches in analogous art a hole injecting and transporting layer may comprise one, two, or more hole-transporting compounds or a laminate of layers comprising different compounds (see col. 18, lines 10-14). Hosokawa et al. teaches porphyrin compounds such as copper phthalocyanine as well as aromatic tertiary amines are particularly preferred hole transporting materials (see col. 17, lines 39-41 and 54-55). It would have

been obvious to one of ordinary skill in the art at the time of the invention to have made a hole transporting region out of multiple hole transporting compounds either in mixture or in separate layers comprised of aromatic tertiary amines (such as TPD compounds) and porphyrin compounds such as copper phthalocyanine, because Hosokawa et al. teach such a combination of hole transporting materials in an organic electroluminescent device have the properties necessary for a well functioning EL device. Per instant claim 20, Hosokawa et al. teaches aromatic tertiary amines and porphyrins are both preferred hole transporting materials (see col. 17, lines 38-47). It would have been obvious to one of ordinary skill in the art at the time of the invention to have used any mixture ratio of porphyrin to aromatic tertiary amine in the hole transporting region, because porphyrin and aromatic tertiary amine are taught as equivalent hole transporting materials and any combination of these two materials in a layer would perform the hole transporting function. The disclosure by Hosokawa et al. wherein in a laminate of multiple hole transporting layers may be present reads upon the additional buffer layer of instant claim 36.

12. Claims 29, 30, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakaya et al. (US 5,792,557) in view of Hosokawa et al. (US 5,458,977) in further view of Mishima (US 2001/0053462 A1). Nakaya et al. and Hosokawa et al. are relied upon as set forth previously. Nakaya et al. teaches a device comprising an anode, hole transporting region, mixed light emitting region, electron transporting region, and cathode (see Figure 1) and all materials recited in claim 29 for the anode, cathode, mixed region, and electron transporting region as discussed in the

rejection over Nakaya et al. Hosokawa et al. is relied upon for the teaching of copper phthalocyanine and tertiary amine such as biphenyl TPD as discussed in the above rejection over Nakaya et al. in view of Hosokawa et al. Per instant claim 29, part (i) Nakaya et al. teaches the ITO anode has a thickness about 10 to 500 nm (see col. 123, lines 66-67). The Nakaya aluminum cathode has a thickness of about 10 to 1000 nm per instant claim 29, part (v) (see col. 123, lines 57-58). Nakaya et al. teaches the thicknesses of the organic light emitting, hole injecting/transporting, and electron injecting/transporting layers are from 5 to 1000 nm thick per instant claim 29, parts (ii) – (iv) (see col. 116, lines 28-32). Hosokawa et al. teaches a laminate hole transporting region that may comprise copper phthalocyanine and aromatic tertiary amine that would have been obvious to one of ordinary skill in the art to have used in the Nakaya et al. device as discussed above. Nakaya et al. and Hosokawa et al. fail to teach a protective layer on the cathode as required by instant claims 29 and 37. Mishima teaches, in analogous art, a protective layer of silicon oxide or silicon dioxide on the outside of the cathode for protecting the organic light emitting device from substances which accelerate deterioration of the device, such as water or oxygen from entering the device (see paragraph 42, page 4). It would have been obvious for one of ordinary skill in the art to have included a protective layer over the cathode for protection, because Mishima teaches the advantages of using such a protective layer on a cathode for protecting the device against degradation. Per instant claim 30, Nakaya et al. discloses doping the mixed light emitting region with rubrene at a concentration of 0.1-20 percent by weight (see col. 121, lines 3-41). Per instant claim 37, the disclosure by Hosokawa et al.

wherein in a laminate of multiple hole transporting layers may be present reads upon the buffer layer (see Hosokawa et al. col. 18, lines 10-14).

13. Claims 25-28, 31, 34, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakaya et al. (US 5,792,557) in view of Mishima (US 2001/0053462 A1). Nakaya et al. discloses all elements of the device of claim 1, as discussed and relied upon above, but fails to disclose a thermal protective layer comprised of SiO or silicon dioxide. Nakaya et al. also teaches all components of claim 34 except the thermal protective layer comprised of silicon oxide or silicon dioxide. Mishima teaches, in analogous art, a protective layer of silicon oxide or silicon dioxide on the outside of the cathode for protecting the organic light emitting device from substances which accelerate deterioration of the device, such as water or oxygen from entering the device (see paragraph 42, page 4). It would have been obvious for one of ordinary skill in the art to have included a protective layer over the cathode for protection, because Mishima teaches the advantages of using such a protective layer on a cathode for protecting the device against degradation. Per instant claim 27, Nakaya et al. discloses all components of the device except the thermal protective layer, part (vi). Nakaya et al. teaches the ITO anode has a thickness about 10 to 500 nm (see col. 123, lines 66-67). The Nakaya aluminum cathode has a thickness of about 10 to 1000 nm per instant claim 29, part (v) (see col. 123, lines 57-58). Nakaya et al. teaches the thicknesses of the regions are from 5 to 1000 nm thick per instant claim 27, parts (ii) – (iv) (see col. 116, lines 28-32). Nakaya et al. teaches all materials required for components (i)-(v). Furthermore, the mix ratio of inventive compound biphenyl TPD (compound x-1) to

tris(8-quinolinolato) aluminum is from about 30/70 to 70/30 per instant claim 27, part (iii) (see col. 122, lines 12-19). Per instant claims 27 and 31, Nakaya et al. fails to teach a thermal protective layer comprised of SiO or silicon dioxide. Mishima teaches in analogous art a protective layer of silicon oxide or silicon dioxide on the outside of the cathode for protecting the organic light emitting device from substances which accelerate deterioration of the device, such as water or oxygen from entering the device (see paragraph 42, page 4). It would have been obvious for one of ordinary skill in the art to have included a protective layer over the cathode for protection, because Mishima teaches the advantages of using such a protective layer on a cathode for protecting the device against degradation. Mishima does not teach the thickness of the protective layer per instant claims 27 and 31;however, it would have been obvious to have formed the protective layer in the range of 5 to 1000 nm, since Nakaya et al. teaches this range of thicknesses as suitable for layers in an organic light-emitting device (see col. 116, lines 28-32). Per instant claim 28, Nakaya et al. discloses doping the mixed light emitting region with rubrene at a concentration of 0.1-20 percent by weight (see col. 121, lines 3-41). Nakaya et al. teaches all components and thicknesses per instant claim 31 (parts (i) – (v)) as discussed previously in this paragraph for claim 27. Per instant claim 31 Nakaya et al. fails to disclose specifically that the electron transport layer may be subdivided into two electron transport layers. Claim 31 requires an electron transport layer contacting the mixed region and an electron transporting layer contacting the cathode. Both of these claimed two layers may be comprised of metal oxinoid. As stated previously, Nakaya et al. teaches the metal oxinoid tris(8-

quinolinolato) aluminum as preferred electron transporting material (see col. 120, lines 49-51). It would have been obvious to one of ordinary skill in the art at the time of the invention to have formed two layers of tris (8-quinolinolato) aluminum electron transporting material, because two layers would perform the same function of electron transporting as a single layer of electron transporting material. Furthermore, Nakaya et al. teaches the thickness of the electron transporting layer may be from 5 to 1000 nm (see col. 116, lines 31-32).

14. Claims 10, 11, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakaya et al. (US 5,792,557) in view of Nishi et al. (US 2002/0034659 A1). Nakaya et al. is relied upon as set forth previously for the rejection of claim 1 upon which claims 10 and 11 depend. Nakaya et al. teaches the light emitting mixed region comprises luminescent material doped at a concentration of 0.1 to 30 percent by weight and teaches it is contemplated to dope with other fluorescent and luminescent materials other than rubrene (see col. 121, lines 37-43). Claim 10 requires the instant mixed light emitting region be doped with a luminescent material that is phosphorescent. Although Nakaya et al. teaches a luminescent dopant, as just stated, it fails to teach a luminescent dopant that is phosphorescent. Nishi et al. teaches in analogous art a mixed region that is doped with phosphorescent PtOEP (per instant claim 11) (see par. 57). It would have been obvious to one of ordinary skill in the art to have doped the Nakaya et al. mixed region with a luminescent material such as phosphorescent PtOEP, because Nakaya et al. teach any luminescent material may be used as a dopant and Nishi et al. teach PtOEP is a known luminescent dopant for a

mixed light emitting region of an organic electroluminescent device. Nakaya et al. fails to teach per instant claim 33 the electroluminescent elements are part of a display. Nishi et al. teach display devices are manufactured by using organic light emitting elements (see par. 2). It would have been obvious to one of ordinary skill in the art to have used the Nakaya et al. organic electroluminescent elements in a display, because it is very well known in the art that individual electroluminescent elements are used to form a full display as taught by Nishi et al.

Double Patenting

15. Claims 1-3, 6-9, 12-14, 21, 25-32, 34, 35, 38, and 40-42 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 7, 8, 29, and 32-35 of copending Application No. 10/005,930 (hereinafter '930). Although the conflicting claims are not identical, they are not patentably distinct from each other because '930 claim 1 requires the same components as the instant claim 1, but does not limit the first hole transport material to biphenyl TPD. '930 does, however, set forth the hole transporting material as biphenyl TPD in dependent claims 8, 29 and 32-35. This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

16. Claims 1-3, 6-9, 12-14, 21, 25-32, 34, 35, 38, and 40-42 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 12, and 26-31 of copending Application No. 10/005,970 (hereinafter '970). Although the conflicting claims are not identical, they are

not patentably distinct from each other because '970 claim 1 requires the same components as the instant claim 1, but does not limit the first hole transport material to biphenyl TPD. '970 does, however, set forth the hole transporting material as biphenyl TPD in dependent claims 12 and 26-31. This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dawn Garrett whose telephone number is (703) 305-0788. The examiner can normally be reached Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly can be reached at (703) 308-0449. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-2351.

Dawn L Garrett
DAWN GARRETT
PATENT EXAMINER
TECHNOLOGY CENTER 1700

D.G.
June 9, 2003